
BASIN OVERVIEW

The Payette River drains an environmentally diverse 3,320 square mile watershed in west-central Idaho. Approximately 4,000 stream miles delineate the basin. Three major branches, the North, Middle, and South forks, conveying water from the mountainous headwaters, converge at the southwestern edge of the Idaho batholith to form the Payette River (Map 1, page 2). The confluence of the South and Middle forks in Garden Valley, 80.7 miles upstream from the mouth, forms the Payette River proper. However, the eight-mile stretch between Garden Valley and the North Fork confluence at Banks is locally known as part of the South Fork Payette, and will be referred to as such in this plan.

The Payette River Basin coincides with U.S. Geological Survey hydrologic cataloging units 17050120; 17050121; 17050122; and 17050123 (Map 1). For descriptive purposes the Payette River Basin can be subdivided into three subbasins. These are generally described below and depicted in Map 1.

North Fork Payette Subbasin

The North Fork, which drains about one-third of the Payette River Basin, begins in the numerous mountain lakes and snow fields surrounding Payette Lake. Below the lake, the river meanders approximately 40 miles through Long Valley before it enters a narrow, steep gorge and cascades to its confluence with the Payette River at Banks. Elevations in the North Fork drainage range from 8,000 feet at Fitsum Peak to 5,000 feet on the floor of Long Valley, and drop to 2,800 feet at Banks. Major North Fork tributaries are Lake Fork, Gold Fork, and Boulder Creek, all of which flow into Cascade Reservoir.

South Fork Payette Subbasin

The South Fork Payette originates near the 9,000 foot-level on the western slopes of the Sawtooth Range. It flows generally westward for 55 miles through a narrow mountain valley. Near Lowman, the South Fork is joined by a major tributary, the Deadwood River. The Middle Fork emanates on the south and west slopes of the Salmon River mountains, draining mountain ridges between 8,000 and 9,000 feet high. It flows 35 miles southwest to join the South Fork near Crouch. Technically the main Payette River begins at this point. (In this plan, the reach down to Banks is referred to as the South Fork Payette River.) Together, the South and Middle fork watersheds encompass slightly more than one-third of the Payette River Basin.

Main Payette Subbasin

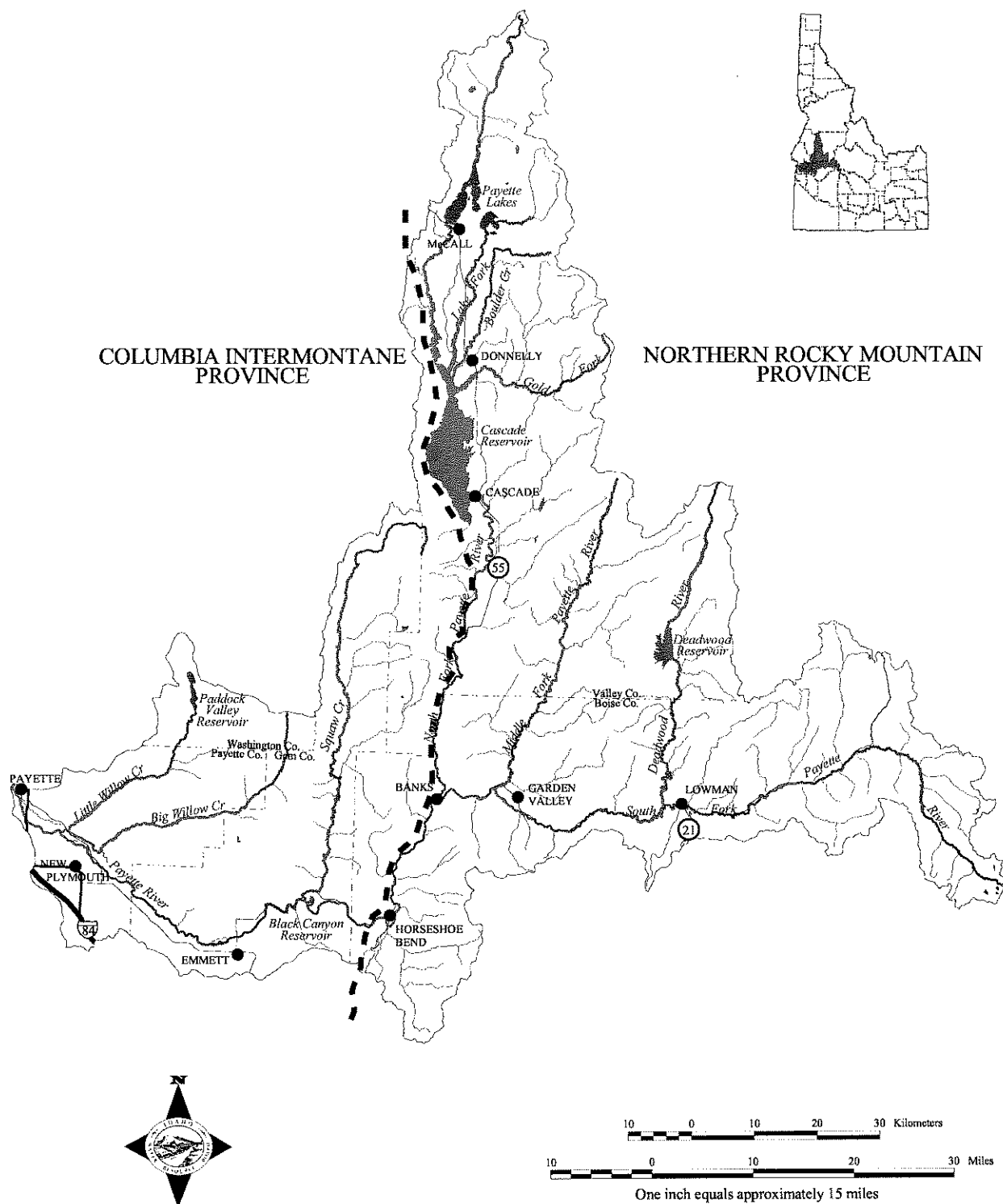
Below Banks, the Payette River flows south to Horseshoe Bend and then generally west to join the Snake River near the town of Payette at 2,100 feet in elevation. Significant tributaries in the lower third of the basin are Squaw Creek, and Big and Little Willow creeks. Squaw Creek headwaters begin at about 8,000 feet in elevation. Big and Little Willow headwaters are considerably lower, generally beginning at below 4,000 feet in elevation.

Geomorphology and Soils

The Payette River Basin is located in two geomorphic provinces. The boundary between them roughly corresponds to the base of West Mountain and the axis of the North Fork Payette River (Map 2). The Northern Rocky Mountain geomorphic province encompasses the eastern half of the basin, and the

Map 2. Geomorphic Provinces

(Source: Ross & Savage, 1967)



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western half is within the Columbia Intermontane geomorphic province.

Terrain in the Northern Rocky Mountain province is characterized by large, north-south trending ridges separated by long narrow valleys, a result of block faulting and erosion of the Idaho batholith -- a Cretaceous granitic intrusion. Alluvium fills the fault valleys, especially Long Valley (Schmidt and Mackin, 1970). The primary river forks and major tributaries generally follow geologic faults, typically joining at right angles. Upland features are predominately steep, deeply incised slopes with gradients in excess of 60 percent. Mid-slope landscapes are steep to moderately steep, with dendritic V-shaped drainages. Floodplains in the upper basin are generally narrow and confined, and in some places defined only by stream channels.

Glaciation during the Pleistocene Epoch is responsible for some dramatic landscape features. Alpine glaciers carved U-shaped stream valleys, and the steep peaks and small cirque basins found at higher elevations (Jenks, 1997). Small lakes often fill the cirque basins. Icecap glaciation flattened a significant portion of the watershed north of McCall, excavating Payette Lake, Little Payette Lake and Upper Payette Lake. Ridge tops in the upper basin are somewhat smooth and rounded. Moraines and outwash deposits of varying age are identifiable in many Northern Rocky Mountain drainages and are particularly prominent in Long Valley (Schmidt and Mackin, 1970; Othberg, 1987).

Terrain in the Columbia Intermontane province is characterized by rolling hills or badland topography and terraced alluvial valleys. Upland features are moderately steep and incised; ridge tops are generally smooth and rounded. First and second-order streams are dry much of the year and a trellis-type drainage pattern is common. The topography

relates to a substructure dominated by a folded and warped complex of late Tertiary basalts and lakebed sediments (Savage, 1961).

Valleys in the Columbia Intermontane province are deeply alluviated, and commonly contain an intricate series of terraces and old river channels (Savage, 1961). The lower Payette Valley is a terraced alluvial plain, extending 30 miles from a point east of Emmett to the Snake River near Payette. Its width varies from four to six miles, with the decrease in elevation ranging from 2,379 feet at its eastern margin to 2,140 feet at the Snake River. Surface drainage patterns are modified by irrigation and drainage projects.

Soils of the Payette River Basin are primarily disintegrated granites which form coarse-grained, gray or yellowish-gray soils. Much of the soil at lower elevations has been derived from silica-rich ash, clay, silt and arkose of the Idaho Formation. Varying thicknesses of loess also form soil types in the basin. While soils are generally shallow in most of the basin, some bottom lands have built up a considerable thickness of soil and partially weathered debris from adjacent slopes. The county soil reports, prepared by the U.S. Natural Resources Conservation Service, contain detailed soil characteristics applicable to the soils of this basin. Soil association, types, agricultural use, and land capability are discussed in these reports.

Climate

The Payette River Basin's climatic regime is broadly characterized by warm, dry summers and cold, moist winters. Climatic patterns in general are influenced by latitude, distance from oceans, mountain barriers, prevailing winds, and variations in altitude. The Payette River Basin is located at approximately 44° north latitude and 500 miles inland from the Pacific Ocean. North and east of the basin,

the Rocky Mountains act as a barrier to the more severe arctic cold and destructive summer storms which are common on the Great Plains. General aridity and a relatively wide temperature range between summer and winter are largely attributable to the Cascade Range in Oregon and Washington, which creates a major barrier to maritime air masses.

Within the basin, elevation and topographic barriers are the most important factors influencing temperature and precipitation differences, and consequently climatic distinction between the lower and upper basins. A semiarid climatic classification has been applied to the lower Payette Valley and tributary watersheds below Squaw Creek, and a sub-humid continental classification to the mountainous portion of the basin. Table 1 displays climatological data from weather stations in the Payette River Basin.

Pacific maritime air masses brought into the region by prevailing westerly winds contain moisture which is the source of nearly all precipitation in the

basin. Through June, July, and August, a stationary low pressure trough along the west coast of the United States positions a high-pressure ridge and its associated subtropical air over Idaho. This relatively dry air results in only modest rainfall over the basin during most summers (Figure 1). Occasionally, summer thunderstorms develop as moist air, from the Gulf of Mexico or subtropical Pacific Ocean, circulates northward.

By September intensification of the upper westerly winds results in a more west-to-east air movement aloft. At the same time, eastward migration of the Pacific longwave trough allows frontal systems to move into Idaho. November, December, and January are generally the wettest months of the year in the Payette River Basin. Southward progression of dry polar air masses often results in decreased mid-winter precipitation. However, a second cycle of precipitation usually occurs during spring, as the polar front returns northward into Canada.

Table 1. Climatological Summary Data 1961-1990.

Station	Payette	Emmett	Ola	Garden Valley	Lowman	Cascade	McCall
Elevation (feet)	2150	2370	2990	3212	3920	4896	5025
Annual Precipitation (inches)	11	13.1	20.1	23	25.4	22.2	27.7
Annual Snow Fall (inches)	18	18	27	71	91	95	152
Average January Precipitation	1.5	1.6	2.6	3.7	2.8	2.8	3.8
Average July Precipitation	0.2	0.2	0.5	0.5	0.8	0.6	0.8
Avg. January Minimum (°F)	19	21	16	17	14	11	12
Avg. January Maximum	36	37	34	35	34	29	31
Avg. July Minimum	56	55	51	47	43	44	44
Avg. July Maximum	93	92	90	91	88	82	81
Lowest Temperature 1961-90	-26	-27	-37	-30	-32	-36	-31
Highest Temperature 1961-90	109	109	107	108	108	100	99
Growing Season†	141	143	101	92	58	68	57

†Number of days daily minimum temperature is greater than 32°F, 5 years in 10.

Source: Abramovich, Molnau and Craine, 1998.

Much of the precipitation that falls on the basin is initiated by orographic lift. Average annual precipitation at Payette in the lower Payette Valley is less than 12 inches, but on higher mountain peaks it may be 60 inches, much of it as snow (Map 3). Winter precipitation is about evenly divided between rain and snow at elevations below 3,000 feet, but above that level most of the precipitation occurs as snow.

Land Ownership and Use

The Payette River Basin spans slightly more than 2.1 million acres across southwest and central Idaho. About 60 percent of the Payette River Basin is publicly owned (Figure 2). Federal agencies manage over 1.2 million acres; state and local governments oversee about 135,000 acres. The U.S. Forest Service and the U.S. Bureau of Land Management are the largest land managers in the basin. Other federal agencies managing land in the Payette River Basin include the U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service. Private interests own and manage more than 700,000 acres in the Payette River Basin or nearly 34 percent of the total land area. Map 4 (page 12) delineates land ownership and jurisdiction in the basin.

Topography, climatic conditions and soil are major influences on land use in the basin. Vegetation distribution in the Payette River Basin, while locally complex because of rugged terrain, falls into two primary land covers: lowland sagebrush grasslands and upland evergreen forests. Table 2 (page 14) lists acreage and Map 5 (page 13) illustrates each classified land coverage in the basin.

The North Fork Payette and South Fork Payette subbasins are predominately forested, with the main tree associations consisting of ponderosa pine, Douglas fir, subalpine

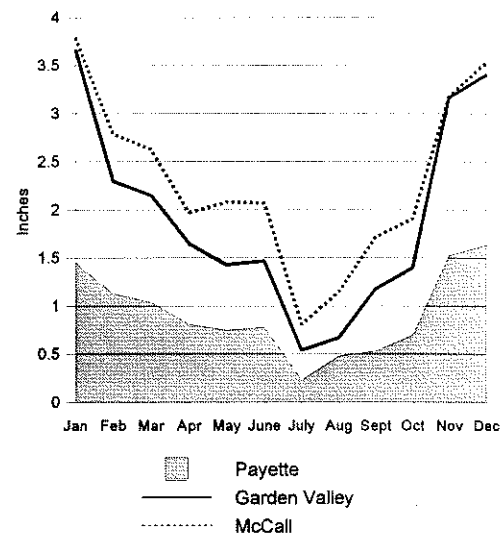


Figure 1. Average Monthly Precipitation in Inches, 1961-1990 (Abramovich, Molnau and Craine, 1998).

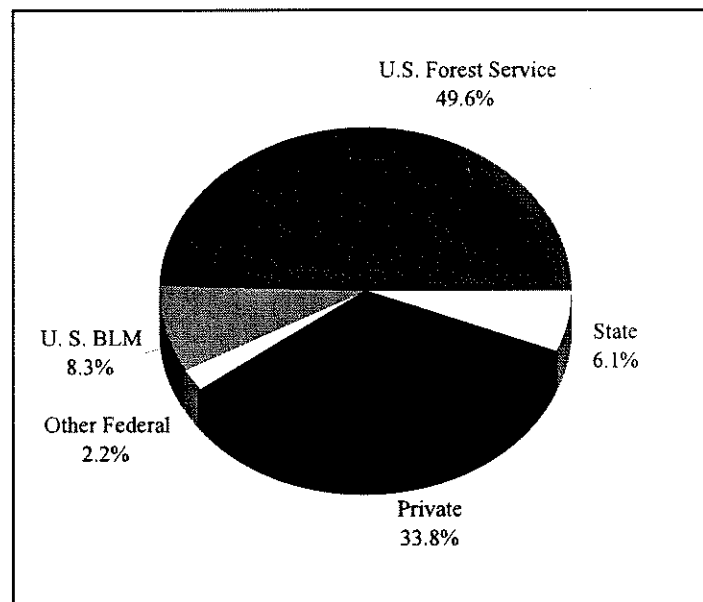
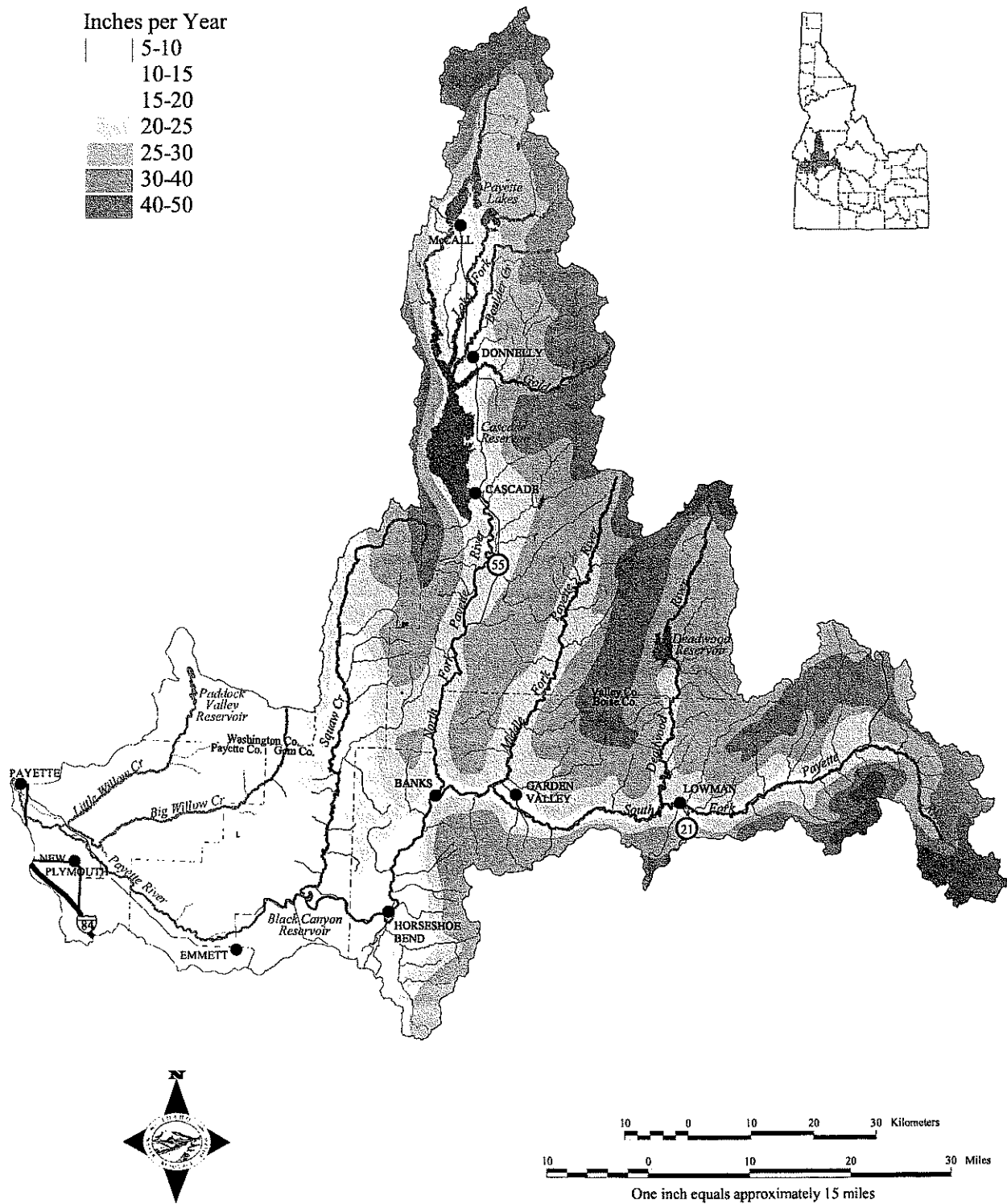


Figure 2. Land Ownership/Jurisdiction in the Payette River Basin. (Derived from U.S. Bureau of Land Management 1:100,000 Surface Management Status maps)

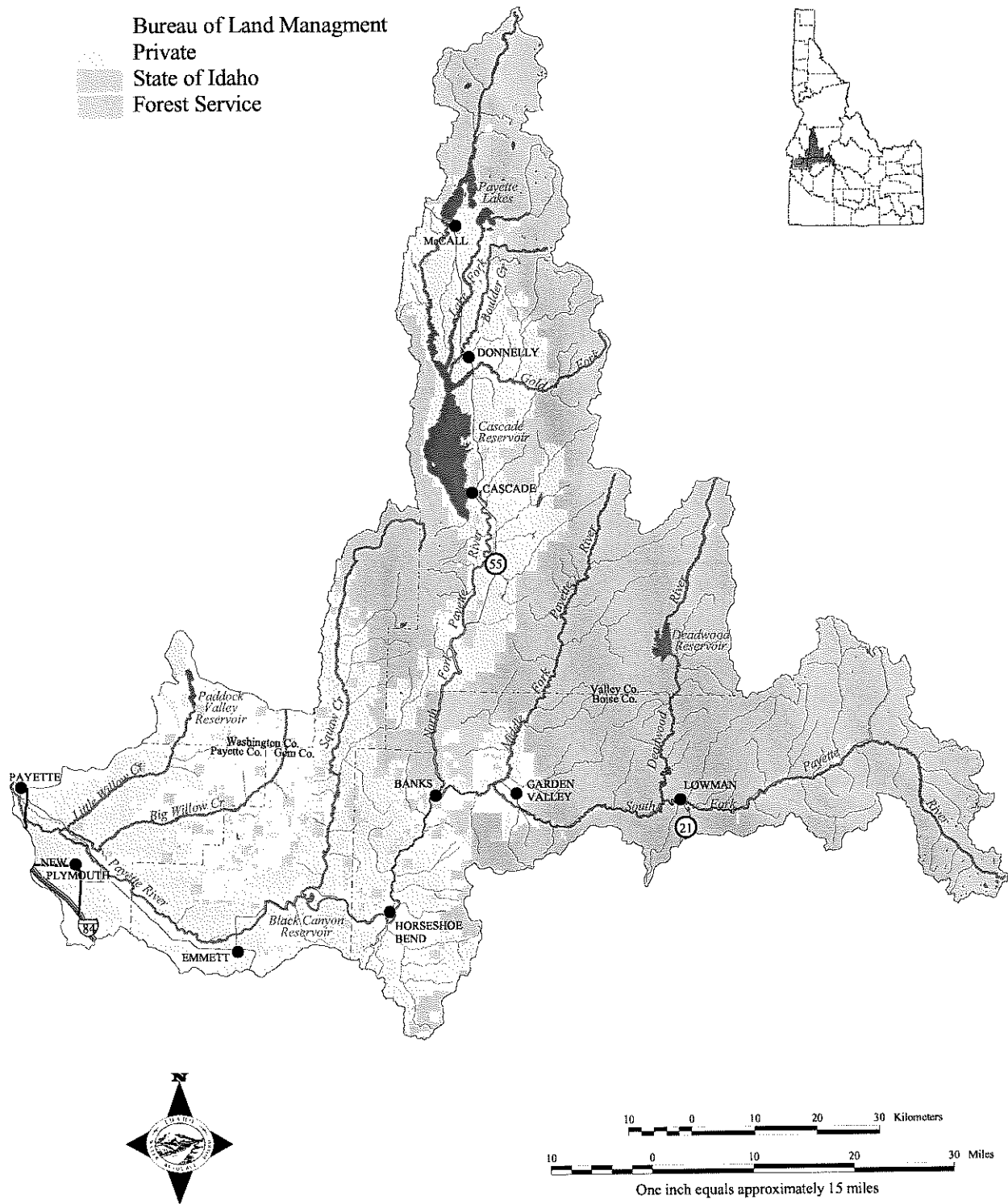
Map 3. Precipitation

(Source: Molnau, 1991)

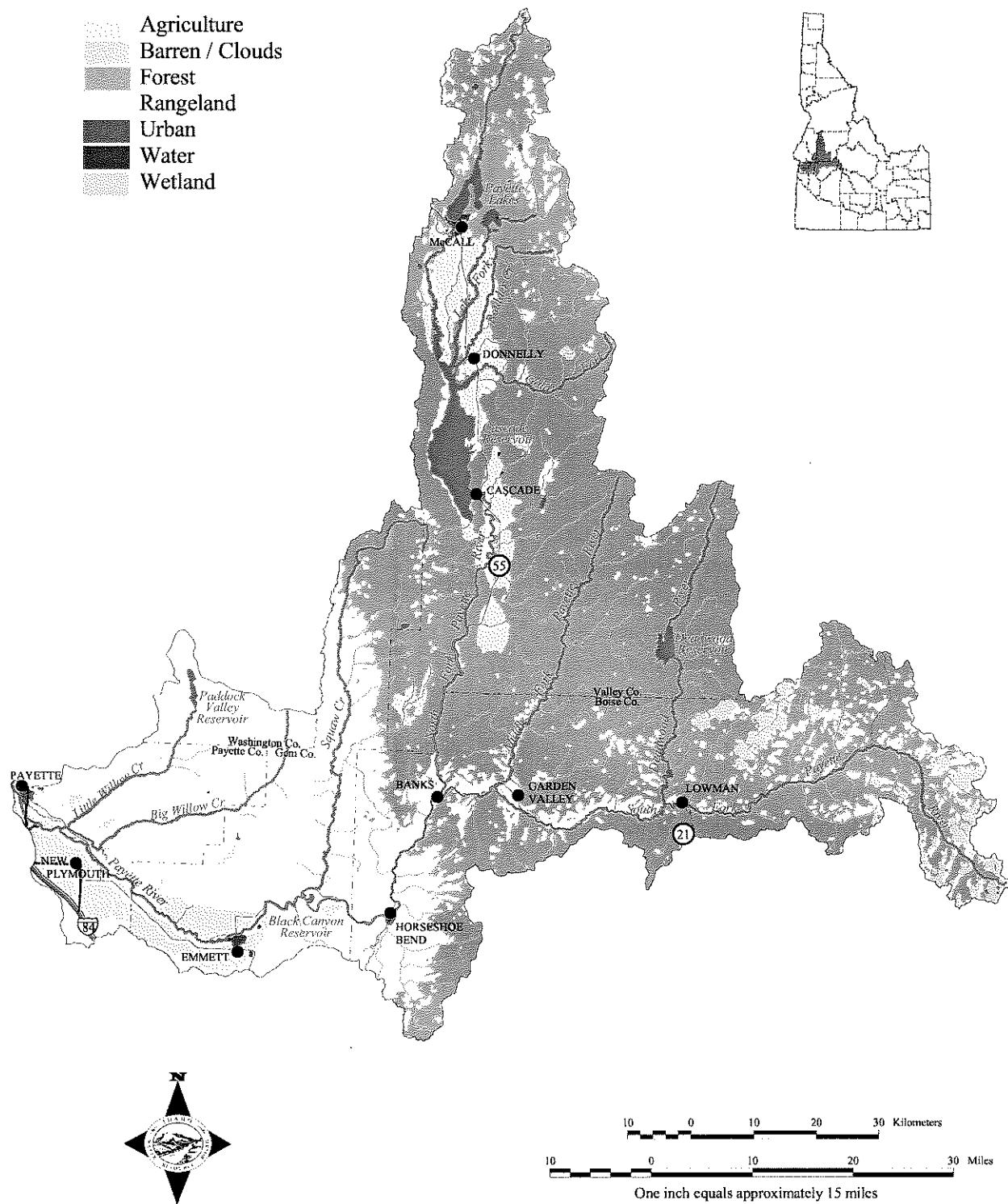


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Map 4. Land Ownership/Jurisdiction



Map 5. Land Cover/Use



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Table 2. Land and Water Area and Land Cover in the Payette River Basin.

Coverage	Acres	Percentage
Land Area	2,083,504	98.1
Water Area	<u>40,230</u>	1.9
Basin Total	2,123,734	
Land Cover		
Forest Land	1,161,388	54.7
Range Land	669,244	31.5
Agricultural Land	195,299	9.2
Urban or Built-up Land	5,018	2.4
Barren land	14,432	0.7
Wetland	2,919	0.1

Derived from a computer classification of Landsat Thematic Mapper data from June 1992 and August 1993.

fir, lodgepole pine, and Engelman spruce. Brush fields blanket many old burn or harvest areas. South facing mountain slopes are often grass-covered. Dominant land uses in the forested areas include timber harvest and recreation. Other land uses include livestock grazing and residential development. Livestock grazing occurs on irrigated and non-irrigated private lands, and on public lands. Residential development is concentrated around Payette Lake and Cascade Reservoir, with more rural development in Long and Round valleys in the North Fork Payette subbasin. In the South Fork Payette subbasin, residences are found in the Garden Valley and Lowman areas along the Middle Fork Payette and South Fork Payette rivers.

In the Main Payette subbasin where land is not irrigated or developed, native vegetation is dominated by a series of sagebrush associations. Grasses include wheatgrass, Idaho fescue, bluegrass, cheatgrass, needlegrass, and snowberry. Rangeland grazing and irrigated agriculture are the predominant land uses. Residential development is concentrated in Horseshoe Bend and the lower Payette Valley, including the communities of Emmett, New Plymouth, Fruitland, and Payette.

Transportation

Waterways and the surrounding mountain ranges significantly limit transportation networks in the Payette River Basin. State Highways 21, 52, and 55 are the primary automobile and truck transportation routes. Idaho State Highway 55 is a major north-south route, and one of the busiest roads in the state. The Idaho Transportation Department estimates that traffic on Highway 55 increases by three percent each year (Viste, 1997). In the lower Payette Valley and Long Valley, a majority of the section lines are improved roads.

The Idaho Northern & Pacific Railroad provides freight service between Payette and Cascade. Railroad tracks built for timber harvest operations up tributary drainages, and the lines between McCall and Cascade, and Nampa and Emmett, have been removed. Train excursions are offered on weekends between Cascade and Smiths Ferry by Idaho Historical Railroads, Inc., a nonprofit organization.

Air transportation into the basin is facilitated by numerous public-use airports near towns, ranger stations, and U. S. Bureau of Reclamation facilities. The Cascade and McCall airports are major access points for the Idaho backcountry. The Cascade airport, with a 4,300 foot-long asphalt runway, is

owned by the City of Cascade. McCall's municipally-owned airport, with its 6,150 foot-long asphalt runway, serves as a major Air Tanker and Smoke Jumper Base for the U.S. Forest Service.

Navigation

Under the Idaho Admissions Act and the Idaho Constitution, the State claims title to all bodies of water that are navigable. Under this claim a stream must have been used as a "highway of commerce" on the date that the state of Idaho was admitted to the Union (July 3, 1890). State title applies to the bed and banks below the ordinary high water mark. The State claims title to the beds and banks of all rivers and lakes in the Payette River Basin listed below (Idaho Department of Lands, 1986):

Rivers

North Fork Payette - Payette Lake outlet to Banks
South Fork Payette - West boundary of T9N,
R9E (downstream of Blue Jay Creek) to Banks
Main Payette - Banks to mouth

Lakes

Boulder Lake
Box Lake
Granite Lake
Louie Lake
Payette Lake
Little Payette Lake
Upper Payette Lake

Commercial navigation is defined as the moving of commodities by water. No commercial navigation currently occurs in the Payette River Basin. Outfitters use some reaches in the basin for commercial float trips. Eight outfitters are licensed by the Idaho Outfitters and Guides Licensing Board to operate on reaches of the North Fork, South Fork and main Payette rivers. This activity is discussed further in the *Recreation* section.

Basin History

PREHISTORY

Archeological evidence indicates human presence in the Payette River Basin over the last

10,000 years (Ames, 1982; Arnold, 1984; Reddy, 1995a). Aboriginal people foraged the lengths of the Payette River Basin. Seasonal salmon migrations provided an abundant protein resource. Berries, the camas bulb, and other roots could be gathered in the mountains and high valleys during the summer. Small and large game were hunted in the upper basin during the summer and in the lower river valleys during the winter. Timber Butte, southwest of Banks, was a regional source of valuable obsidian.

The Payette River Basin was a contact zone between the Columbia Plateau culture from the north and west, represented today by the Nez Perce, Cayuse, Umatilla, and the Great Basin culture from the south and east, represented by the Northern Shoshone, Bannock, and Northern Paiute. Prehistoric site artifacts in the basin indicate a mixed material culture reflecting both Plateau and Great Basin influences (Arnold, 1984). In historic times, Northern Shoshone and Paiute families occupied winter camps in the lower Payette Valley. During the summer they might travel to the upper basin valleys to hunt big game, gather seeds, roots, and berries, and lay fish traps. Nez Perce utilized Payette Lake and Long Valley which they called "*Two-e-new-he-ess-pah*" — "Land of the Silver Tip Grizzlies" (Arnold, 1984; Jones, 1996).

The most indigenous group was the Tukudeka, often referred to as the Sheepstealer Shoshoni, who inhabited the mountains of west-central Idaho (Ames, 1982; Arnold, 1984; Jones, 1996). Tukudeka language and culture set them apart from other Shoshoni groups. They exploited their range in much the same way as the Nez Perce, but depended more than the Nez Perce on big game hunting in the high mountains. Expert hunters and furriers, they often trapped and tanned exotic, scarce animals for their skins. Their quality dressed furs, skins, and tailored garments were in demand for trading, as were their highly crafted mountain sheep horn bows (Reddy, 1995b).

Groups of two to three Tukudeka families moved seasonally from place to place hunting, in conjunction with root gathering and fishing, in preparation for winter. Long Valley and its vicinity was a summer habitat where the Tukudeka gathered food and fished (Arnold, 1984; Jones, 1996). During the winter, Tukudeka families would gather at good fishing spots along the rivers to set up semi-permanent encampments. Camps would vary in population from year to year, depending upon where the seasonal round left people at the start of winter. The lower Payette Valley and Smiths Ferry were popular winter campsites (Mills, 1963; Wells, 1980; Reddy 1995b).

After the Nez Perce (1877) and Bannock Wars (1878), the only Native Americans in southern and central Idaho not confined on a reservation were Tukudeka groups in the Salmon River Mountains and the Payette River Basin. In the Dry Buck Valley west of Banks, a Tukudeka group attempted an isolated, settled life; farming, planting orchards and working in a sawmill (Ames, 1982; Reddy, 1995b). They attracted little attention from the outside world. About 1900, following the death of Eagle Eye, their patriarch, the families reluctantly decided to move to the Lemhi Reservation where they had a Tukudeka spokesman. In 1907 the Tukudeka were forced to move to the Fort Hall Reservation when the Lemhi Reservation closed (Wells, 1980; Ames, 1982; Reddy, 1995b).

HISTORY

William Clark's map of the western United States, published in 1814, delineates the Payette River, Timber Butte ("Flint Rock"), the South Fork Payette, and the North Fork Payette to Payette Lake ("Shallet Lake"). Clark's depiction of the Payette River Basin and surrounding territory is probably based on a relief map of southwest Idaho prepared by a Shoshoni at the explorers' Lemhi camp (Wells, 1978). Donald McKenzie is acknowledged as the first

European to encounter the Payette River in 1811. He was a partner in the Astor Company and bound for the mouth of the Columbia as a group leader with the Wilson Hunt party.

McKenzie returned to Idaho in the spring of 1818, leading the first "Snake country" trapping expedition. Francois Payette, a young trapper of French-Canadian and Native American descent, accompanied McKenzie on this expedition. From 1818 to 1834, trapping expeditions annually invaded southwestern Idaho. British, American, French-Canadian and native trappers fanned out over the region, methodically traversing the rivers and creeks, often with their families (Mills, 1963; Ingraham, 1992). On a map of the Oregon Territory dated 1838, the Payette River is called "Lake River," and Payette Lake is labeled "Woods Lake" (Preston, 1972).

Francois Payette, who first saw the river that bears his name in 1818, participated prominently in the Snake country brigades and became the first manager of Fort Boise, the Hudson Bay Company's regional outpost. Payette lived at Fort Boise until 1844. Payette's sons, Louis and Joseph, who married or lived with local Native American women, were the first stockmen in the Payette Valley. By 1850 maps of the territory identify "Payette's River." According to Mills (1963), the Payette family left the area around 1864, presumably for better trapping in Canada and to escape the hordes of settlers and gold seekers traversing the country.

When gold was discovered in the Boise Basin and at Warren, Idaho in 1862, settlements simultaneously appeared throughout the Payette River Basin. The Brownlee Trail, Packer John Trail, and the Basin Trail (or Placerville Road) were major routes to the mining country through the Payette River Basin. Regular pack trains, express lines, and stage routes with stopping places were established.

Miners paused on their way to "the diggings" to prospect the basin's rivers and streams, or stopped beside the trails to take up land.

In 1862 David Bivens built a home and set up a Payette River ferry at "Bluff Station," near the mouth of Little Willow Creek. A few years later he moved upstream and established a stage stop at the Basin Trail and Overland Road junction (near Falk Bridge). Miners bound for Warren started a town, called Lake City, east of McCall. It lasted only two years, from 1862 to 1864 (Ingraham, 1992). The earliest recorded legal action regarding the Payette River Basin was the granting of a license to operate a ferry across the Payette River near Gardena in 1863 (Mills, 1963). The ferry served the rush of gold-seekers hurrying to the Boise Basin over the Brownlee Trail. The town of Emmett grew up around the Martin and Smith ferry, initiated in the spring of 1863, downstream from a Basin Trail stage stop. By 1864, Horseshoe Bend, a strategic site on the road to Placerville, was bustling with settlers and businesses (Mills, 1963).

Early settlers built their cabins and ranches near the Payette River where fish could be caught, wildfowl shot, and small, easily-dug ditches could bring water for fields and gardens. During the first decade, 1863-1873, businesses were sustained primarily by travelers coming and going on the basin's trails (Mills, 1963; Lyon, 1979). Settlers supplemented their meager incomes by hauling turkeys, chickens, fish, eggs, butter, fruits, and vegetables into the mining camps.

The first settlers in the Garden Valley area were miners who crossed the valley on their way to the Boise Basin via the Packer John Trail. By 1867 families had settled along the lower Middle Fork. They sustained themselves by farming, selling produce, eggs, and milk to miners in the Boise Basin

and Deadwood camps, providing river crossings and stopping places for travelers, and perhaps mining a little on the side (Mills, 1963; Rader, 1981). Logging camps were set-up in the area by the 1870s. Forests along the South Fork and in the Garden Valley area supplied the Horseshoe Bend, Emmett, and Payette sawmills. Annual log drives were synchronized with spring floods (Mills, 1963; Lyon, 1968; Witherell, 1989).

The first substantial settlement in Long Valley was Van Wyck, established in 1882, at a site three-quarters of a mile northwest of the present town of Cascade. In the 1880s and 1890s, other small communities arose: Center, Roseberry, Crawford, McCall, Lardo, and Alpha. Logging and cattle ranching were major industries. The short growing season and high altitude limited crops. Wheat, oats and other grains were cultivated as well as timothy for hay. There were several flour mills in the valley where the settlers' wheat could be ground.

In 1914 the Union Pacific completed the railroad from Emmett to McCall. The coming of the railroad significantly changed Long Valley homesteaders' lives. The railroad was primarily to haul lumber and railroad ties produced in the McCall area, and made commercial logging more profitable. The trains provided freight and passenger service, but towns bypassed by the railroad quickly died. Van Wyck, Crawford and Thunder City moved businesses to the new townsite of Cascade on the railroad line. Roseberry moved many buildings and business west to form the new town of Donnelly (Ingraham, 1992). The town sites of Van Wyck, Center, and Arling are now covered by the water in Cascade Reservoir.

McCall was established in 1899 when a wagon caravan camped along the shores of Payette Lake and the McCall family decided to establish a

residence (Boone, 1988). In 1896 the Warren Dredge Company opened a sawmill on Payette Lake (Valley County Commissioners, 1998). The Hoff and/or Brown families operated a sawmill in McCall for more than 50 years, selling it to the Boise Cascade Corporation in 1964 (Jordan, 1998). The mill was an important part of McCall's economy.

Payette Lake became a popular vacation destination by the early 1900s. People traveled to the area to escape the high summer temperatures of the lower Boise and Payette valleys. Hotels and inns around Payette Lake provided accommodations in the early days. By the 1920s, the inns were being bypassed for individually owned cabins being built around the lake. McCall held its first Winter Carnival in 1922. More than 2000 people came by train to visit and have fun in the snow. Recreation and tourism have remained important to the local economy.

About 1870 Jonathan Smith, with the help of neighbors, constructed the first ditch which diverted water to Payette Valley settlers for milling and irrigation. Part of the Emmettsville Ditch, as it was called, is being used at the present time and waters land southwest of Emmett. The head of the ditch and two miles of its course has since been taken over by the Farmers Co-op Canal. Downstream, near Payette, the first irrigation canal was the Lower Payette Ditch. In 1884 about 16 miles of canal were constructed from the diversion point, near the mouth of Big Willow Creek, to north of Payette; the canal was later extended to Weiser. By the turn of the century, sawmills, irrigated fields, and electric power were evident throughout the lower basin.

Basin Demographics

POPULATION PATTERNS

The Payette River Basin is characteristically rural with an estimated population by the Idaho Department of Water Resources of 37,167 in 1996. This constitutes about three percent of the state's

population. All or parts of five counties lie within the Payette River Basin -- Boise, Payette, Gem, Valley, and Washington. Data on the first four counties, in their entirety, are used to represent the basin. Washington County was excluded because only a small section of the county lies within basin boundaries.

Idaho Department of Water Resources has estimated that 76 percent of the four counties' population live within the basin's boundaries. Population estimates for counties and cities in the basin are presented in Table 3. Population estimates for counties were obtained from Idaho Power Company's 1996 County Economic Forecast and the U.S. Bureau of the Census (1997). Seventy-eight percent of the basin's 1996 population reside in the lower basin (Gem and Payette counties). However, recreation home and property owners add an estimated 19,000 parcels to the upper basin's housing base (Valley and Boise counties; Roark, 1998 and Hileman, 1998).

Estimates and projections of the upper and lower basin's population are illustrated in Figure 3. Population has increased in both regions throughout the period from 1970 to 1995, and it appears that the rate of population increase was greatest in both regions in the early 1990s. The average annual rate of population growth over the period 1970 to 1995 is 2.14 percent, which is greater than the rate for the state as a whole (1.72 percent).

Of the basin's counties, Payette County has the largest population in 1996 (19,957) and the third highest rate of growth in the early 1990s (Table 3). In contrast, Boise County has the smallest population, with 4,864 in 1996, and the highest rate of growth in the early 1990s (36.94 percent). Compared with the state as a whole, the four basin counties demonstrate higher average annual growth rates for the period from 1990 to 1996 (Table 3).

Table 3. Population and Estimates, Percent Growth and State Ranking for Counties and Cities in Payette River Basin.

Location	1970	1980	1990	1991	1992	1993	1994	1995	1996	% Growth 90-96	% Growth State Ranking
Boise County¹	1763	2999	3552	3717	3974	4281	4466	4669	4864	36.9%	
Crouch	71	69	75	80	85	92	98	104	107	42.7%	11
Horseshoe Bend	511	700	643	683	735	798	836	881	921	43.2%	10
Banks	na	na	50	na	na	na	na	na	na	na	na
Garden Valley	na	na	150	na	na	na	na	na	na	na	na
Gardena	na	na	60	na	na	na	na	na	na	na	na
Lowman	na	na	100	na	na	na	na	na	na	na	na
Gem County¹	9387	11972	11940	12287	12463	13178	13547	13871	14129	18.3%	
Emmett	3945	4605	4601	4752	4877	5055	5163	5211	5242	13.9%	69
Letha	na	na	100	na	na	na	na	na	na	na	na
Montour	na	na	50	na	na	na	na	na	na	na	na
Ola	na	na	15	na	na	na	na	na	na	na	na
Sweet	na	na	70	na	na	na	na	na	na	na	na
Payette County¹	12401	15825	16446	16977	17582	18171	19000	19559	19957	21.4%	
Fruitland	1576	2559	2400	2488	2595	2692	2827	2889	2963	23.5%	29
New Plymouth	986	1186	1313	1354	1394	1438	1500	1525	1532	16.7%	53
Payette	4521	5448	5672	5823	6007	6173	6379	6489	6647	17.2%	50
Valley County¹	3609	5604	6150	6544	6898	7352	7623	7848	7988	29.9%	
Cascade	833	945	877	934	974	1020	1043	1057	1059	20.8%	37
Donnelly	114	139	135	143	148	156	158	165	166	29.9%	33
McCall	1758	2188	2005	2174	2336	2534	2667	2787	2876	43.4%	9
Lake Fork	na	na	10	na	na	na	na	na	na	na	na
Smiths Ferry	na	na	22	na	na	na	na	na	na	na	na
State of Idaho			1,011,941						1,189,251	17.5%	na

¹ County population estimates have not been proportionalized to reflect basin population within the county.
Source: Idaho Power Company, 1996; U. S. Bureau of Census, 1997.

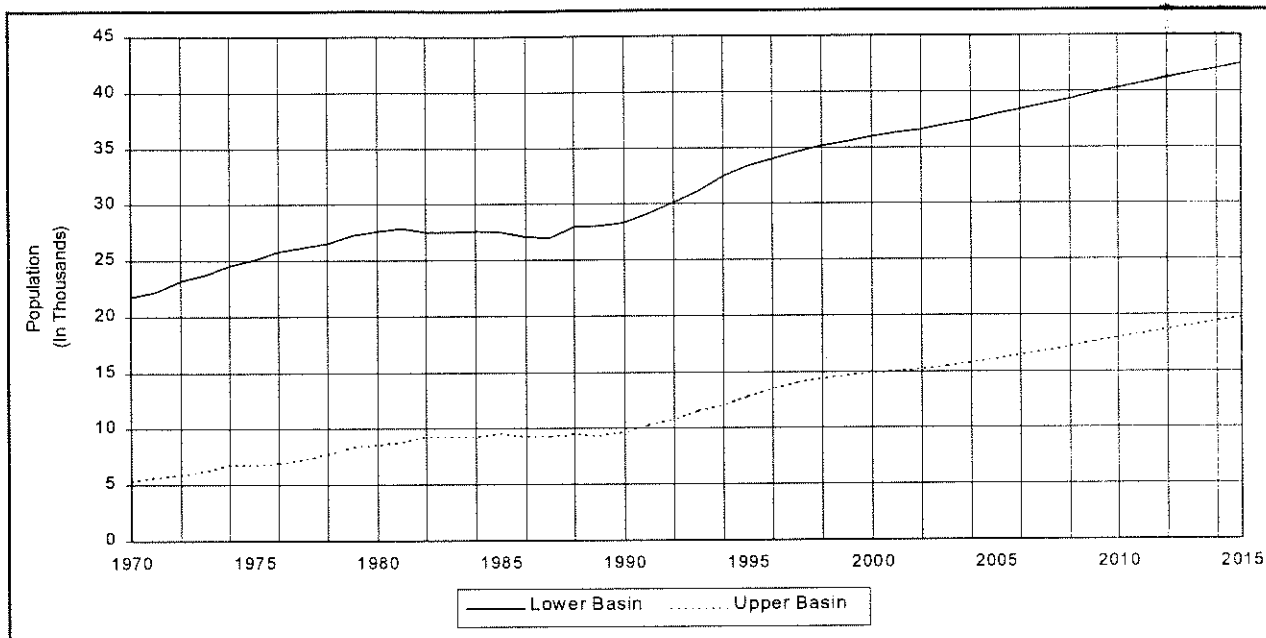


Figure 3. Population Estimates and Forecasts (Idaho Power Company, 1996).

Of the basin cities, the City of Payette is the largest population center with 6,647 residents and has the fourth highest growth rate in the basin between 1990 and 1996 (17.2 percent). McCall is the fourth largest city and has the highest growth rate in the basin between 1990 and 1996 (43.4 percent). McCall, Horseshoe Bend, and Crouch are among the fastest growing cities in the state (ninth, tenth, and eleventh highest, respectively).

The City of Boise, Idaho's largest metropolitan center, is undergoing rapid growth, and in turn stimulating growth in the Payette River Basin. Approximately ten percent of residents in the Garden Valley, Horseshoe Bend, and Emmett areas commute to work in Ada County (Idaho Department of Commerce, 1996). Relatively lower land prices, a rural setting, and abundant recreational opportunities create an attractive real estate market for both commuters and recreation home-buyers. In addition, there are a number of communities located adjacent to the basin which have experienced some of the greatest population increases in the state. These are Boise, Meridian, Nampa, Eagle, Caldwell, and Garden City (U.S. Bureau of the Census, 1997). Growing

populations in these communities place increased demands on resources in the basin, particularly on outdoor recreation opportunities.

Slower growth is expected into the next century (Table 4). Idaho Power Company (1996) estimates an annual growth rate through year 2015 of approximately 1.4 percent. It is likely that rural "amenity rich" counties in the basin that provide recreation, aesthetics, culture, and other amenities and services will continue to experience growth.

Figure 4 illustrates trends and forecasts the number of households and persons per household for the Payette River Basin for the period from 1970 to 2015. The number of households is measured on the left scale of the figure, persons per household on the right scale. In 1995 there were an estimated 14,014 households located in the basin, forecasted to increase almost 50 percent by the year 2015 to 20,955 households. This implies an average annual growth rate between 1996 and 2015 of approximately 2 percent. Note that this is higher than the 1.29 percent projected increase in the population.

Table 4. Average Annual Population Growth Rates 1970 to 1995 and Projected Growth Rates 1996 to 2015.

	Upper Basin	Lower Basin	Payette River Basin	State of Idaho
Average Annual Percentage Change in Population Between 1970 and 1995	3.74%	1.72%	2.14%	1.72%
Average Annual Percentage Change in Population Between 1996 and 2015	2.18%	1.09%	1.44%	1.29%

Source: Idaho Power Company, 1996.

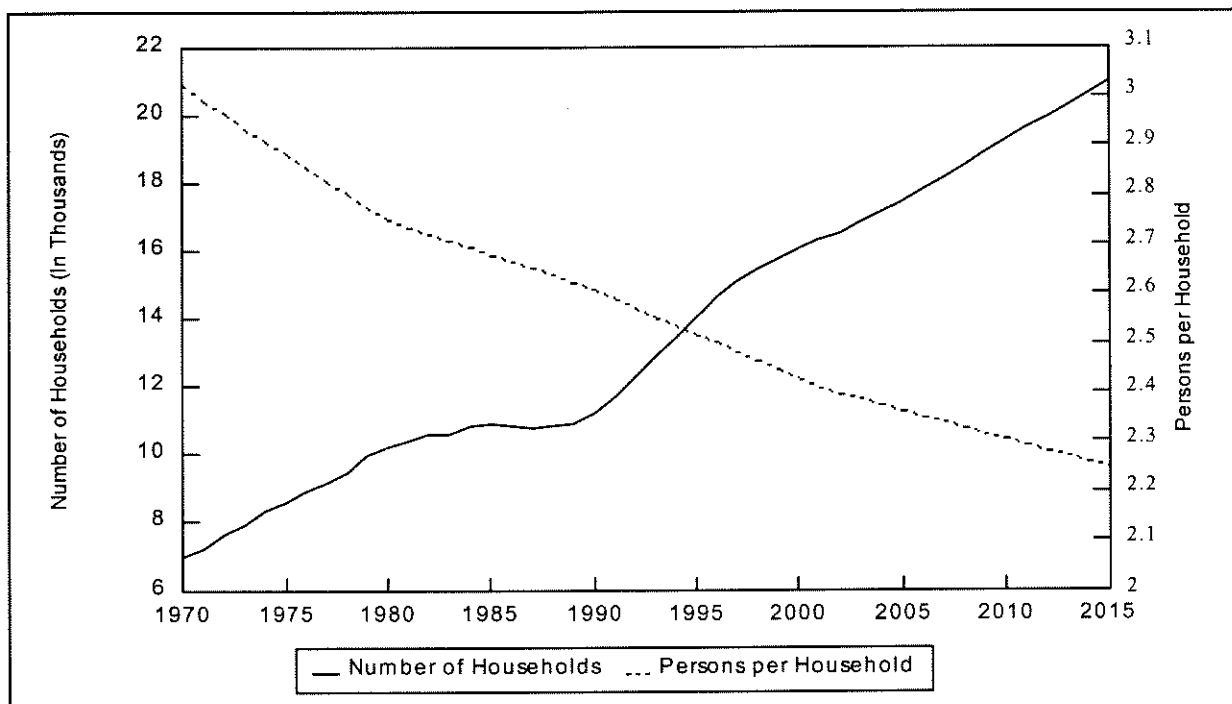


Figure 4. Estimated Number of Households and Persons Per Households with Forecasts (Idaho Power Company, 1996).

The difference between rates of increase in households and population may be explained by the downward trend in household size. The decrease in the number of persons per household, in turn, may be explained by a decrease in children per family and out-migration of young adults. The pattern of out-migration would have been especially strong from the early 1980s through the mid-1990s when rural areas were experiencing significant recession or chronic depression.

Changes in the age distribution of the basin population have some important implications for future demand for housing, services and water resources in the basin. To observe past changes in distributions, age distributions in the basin in 1970, 1980 and 1990 are presented in Figure 5. Note that in the 1970 distribution the largest concentrations of the population are in the age classes between 0 and 19. In 1980 this concentration enlarges to include the age classes between 20 and 44. Finally, in 1990 the

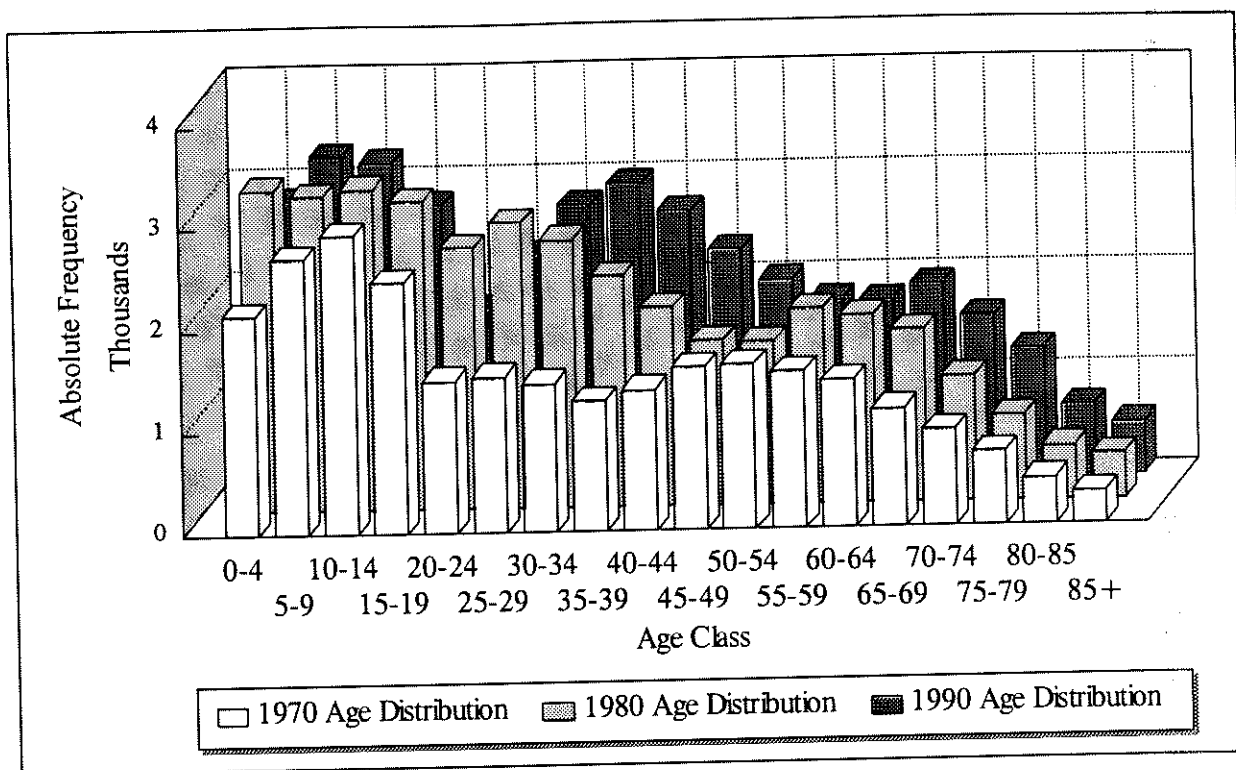


Figure 5. Decennial Census Age Distribution (Church, 1997).

concentration is found in the age classes between 35 and 59. A similar trend may be observed for the 40 through 64 year age classes in the 1970 distribution. In effect, the concentrations in the population move through the age classes over time, changing the demands for housing, services, and water resources.

Recognition of intertemporal changes in distributions allows prediction about future distributions. The highest population concentration in the 1990 age distribution are in age classes 0 through 19. These will likely appear as concentrations in the 20 through 39 classes in the 2000 Census. This implies increased demand for housing, other related investment activities, and durable and nondurable goods and services in the near future. In addition, a secondary concentration in the 35 through 59 year age classes would be expected to move to the right in the distribution. This is expected to impact retirement activities such as recreation and travel, health care services, and retirement community housing.

It is noteworthy that the peak for the younger 1990 age distributions (classes 0 through 19 years) is slightly higher than the previous two decades. As this group proceeds through its life-span, the increases in demand for goods, services, and water resources is likely to be greater than that experienced with previous groups in this age range.

INCOME AND EMPLOYMENT

Figures 6 and 7 illustrate a pattern of growth in real total personal income (i.e. income adjusted for inflation) and fairly constant real per capita income throughout the period from 1970 to 1995. The difference between the two measures can be explained by the sharp increase in population during the same period (Table 4, page 21). Constant real per capita incomes imply area incomes have kept pace with inflation, but not much more than that.

Figures 8 and 9 (page 24) summarize the employment trends in the lower and upper basins. The farm sector has remained relatively static over

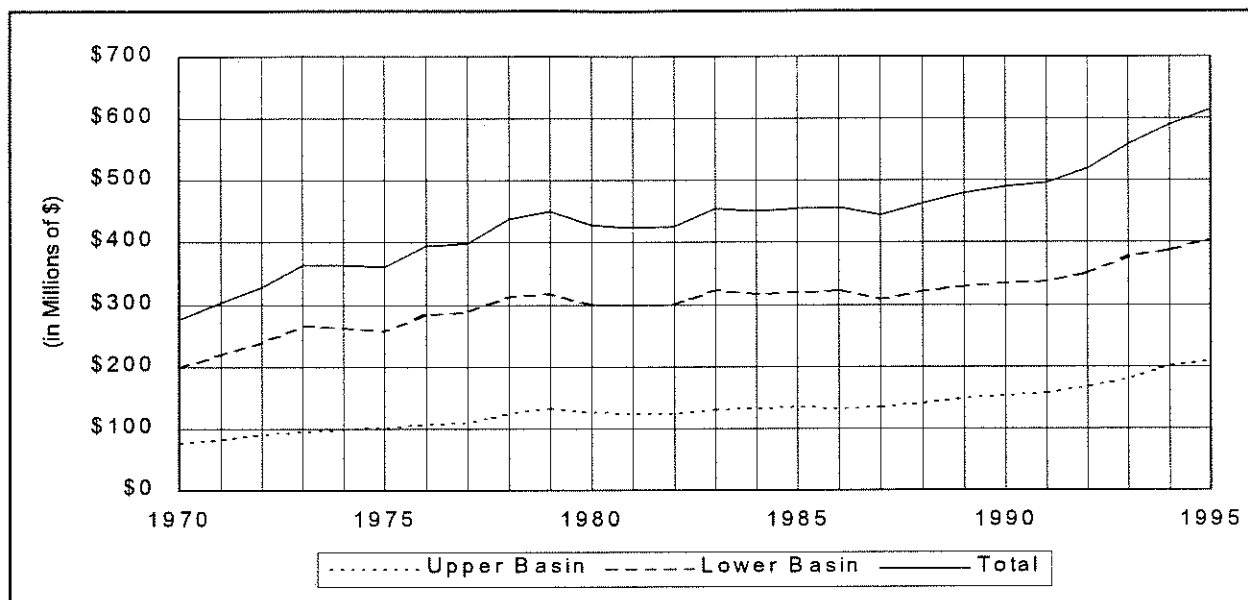


Figure 6. Total Personal Income of the Payette River Basin in 1996 dollars (U.S. Department of Commerce, 1997).

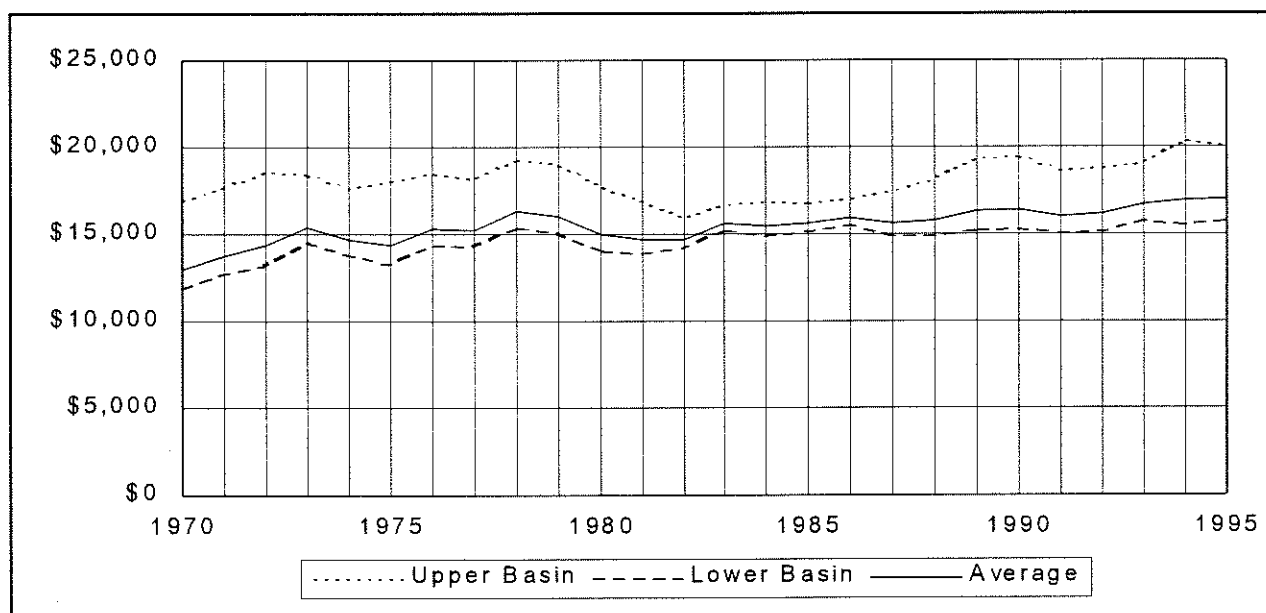


Figure 7. Per Capita Income for the Payette River Basin in 1996 dollars (U.S. Department of Commerce, 1997).

time in both areas, whereas the nonfarm sector has more than doubled in the upper basin and almost doubled in the lower basin. Trends in nonfarm employment have closely followed population growth patterns and total income growth patterns in both the upper basin and the lower basin, showing a steeper upward trend around 1988.

Describing nonfarm employment trends at the level of major industrial categories reveals important changes in the composition of nonfarm employment. In the upper basin, manufacturing, notably lumber and wood products, is one of the two leading employers in the early 1970s, but begins to decline significantly around 1980, ranking only sixth in 1995 (Figure 10, page 25). In contrast, services,

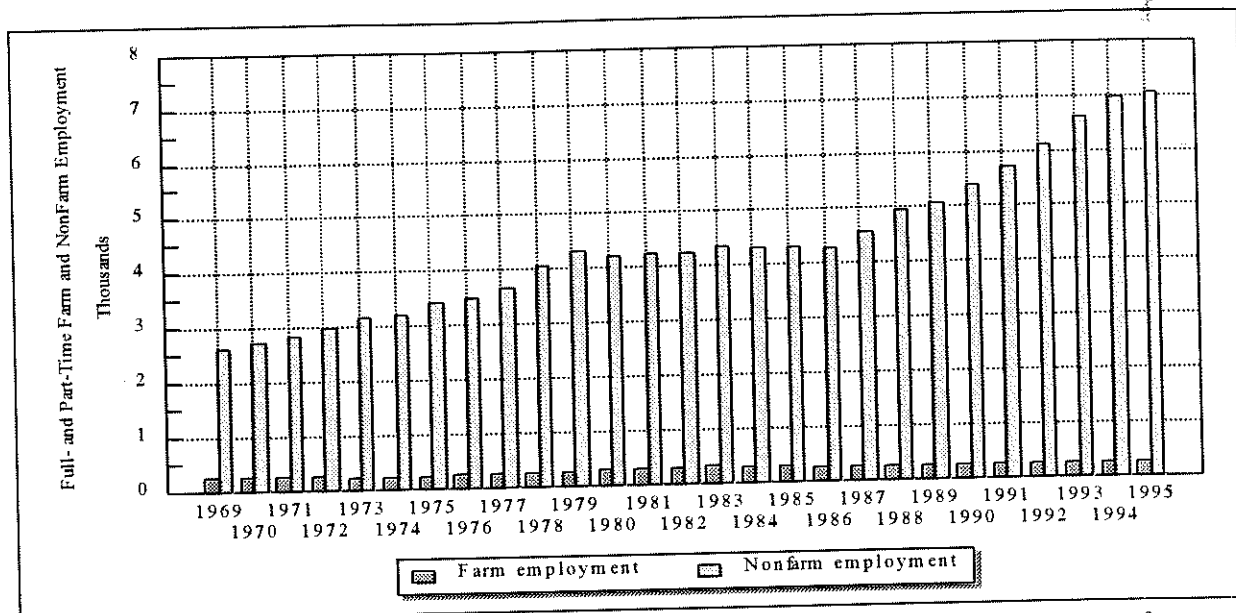


Figure 8. Farm and Nonfarm Employment in Upper Basin Counties (Boise and Valley) (U.S. Department of Commerce, 1997).

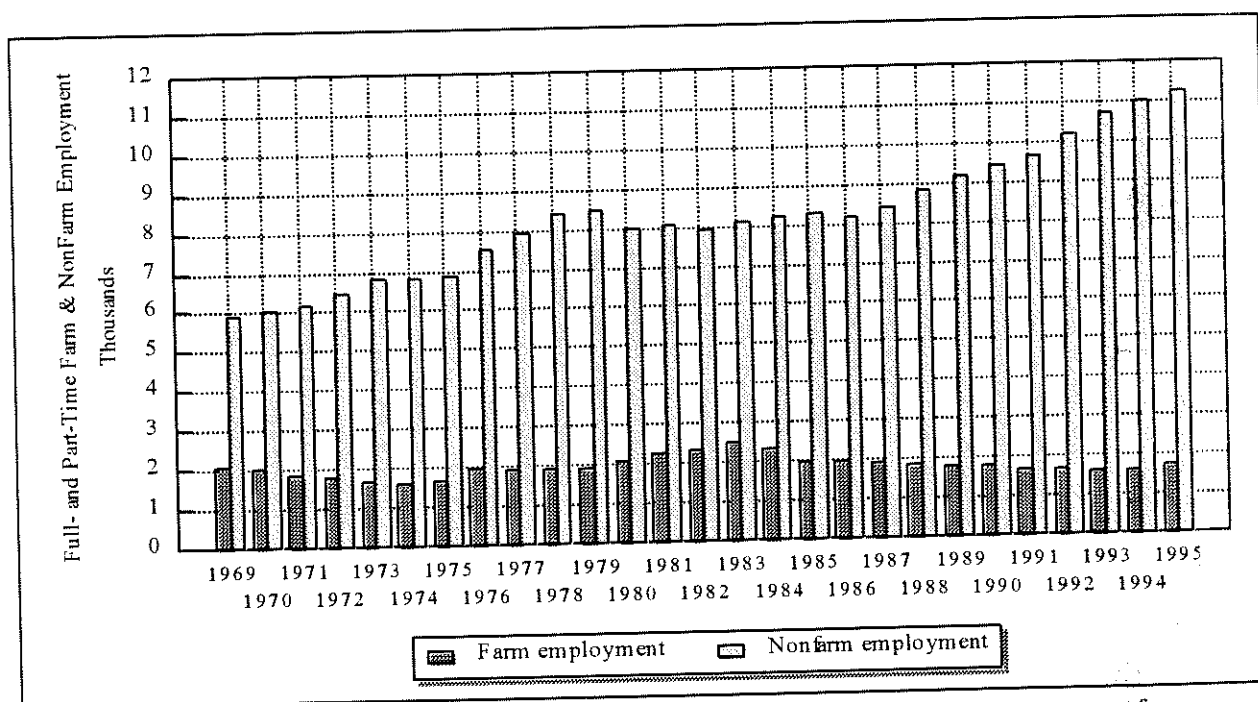


Figure 9. Farm and Nonfarm Employment in Lower Basin Counties (Gem and Payette) (U.S. Department of Commerce, 1997).

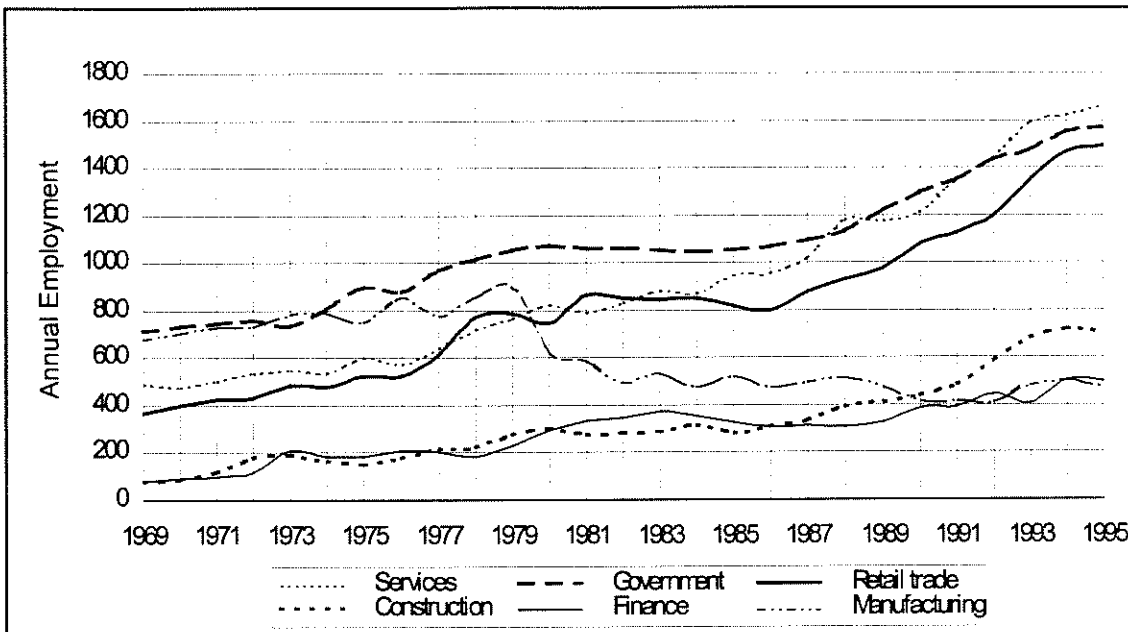


Figure 10. Nonfarm Employment by Major Standard Industrial Classification Divisions for Upper Basin (U.S. Department of Commerce, Bureau of Economic Analysis, 1997).

government, and retail trade are among the top four in the 1970s, increasing throughout the period and becoming the top three employers in 1995. Indeed, the service and retail sectors increase more than threefold during the period, presumably due to the increase in residential and recreational population in the area. Finance, insurance, and real estate (FIRE) also demonstrate rather strong job growth after the mid-1980s.

Therefore, the economy has shifted from mixed manufacturing and service-based to a service-based one. Strong employment growth in the construction sector, but not in the manufacturing sector, since the mid-1980s suggests an increase in residential housing which includes part-time as well as full-time residential housing. The remaining employment categories are not depicted in Figure 10.

In the lower basin, services, manufacturing, government, and retail trade sectors dominate the employment opportunities throughout the period, and

all four sectors demonstrate substantial increases after 1987 (Figure 11). Services have more than doubled over the period and retail has increased by more than 50 percent. (Increases in services and retail reflect the increase in residential and non-residential population using the area.) Manufacturing has nearly doubled. Increases in manufacturing employment reflect strong job formation in food and kindred products (chiefly canned, cured, and frozen foods in Payette County) and lumber and wood products in Gem and Payette counties.

Transportation, communication, and public utilities (T, C and PU), while smaller in absolute terms, have also increased substantially. Construction demonstrates strong growth since 1991, reflecting both manufacturing and residential growth. The remaining employment categories (wholesale; mining; agricultural services; forestry and fishing; and finance, insurance, and real estate) are relatively small, and do not change significantly over the period.

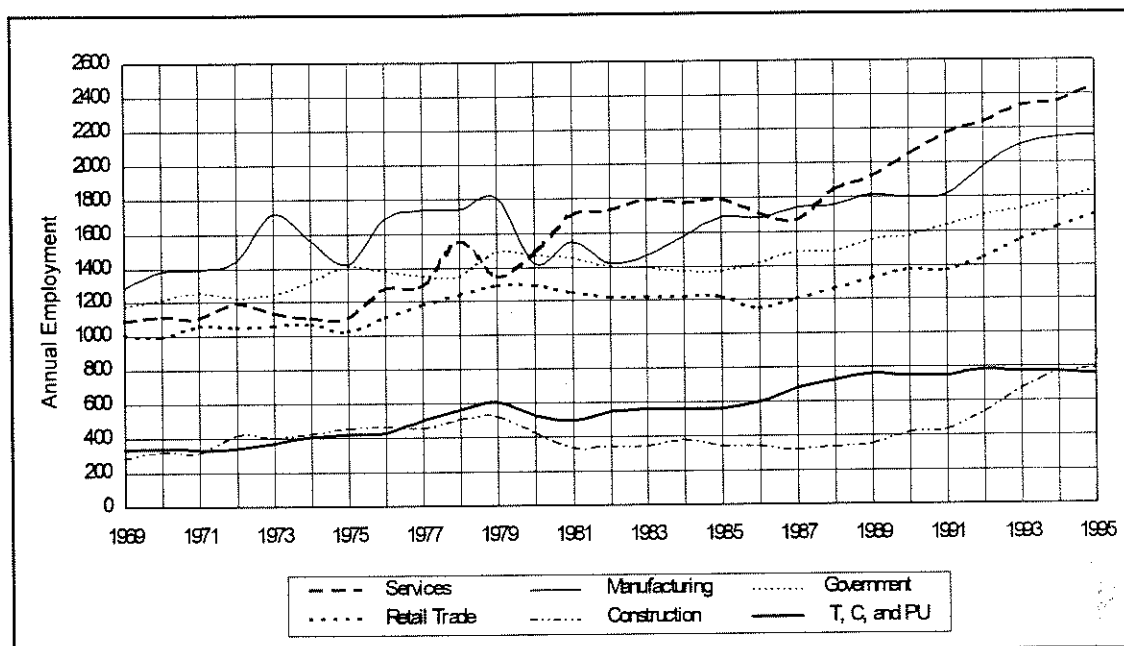


Figure 11. Nonfarm Employment by Major Standard Industrial Classification Divisions for Lower Basin (U.S. Department of Commerce, 1997).

Special Sector Analysis-Agriculture

In view of agriculture's important role in water use, a detailed analysis of the sector is presented in this section. All the data referenced come from two sources. One is the Census of Agriculture which is conducted every fifth year. The most recent estimates are available for 1982, 1987, and 1992. The second is the U. S. Department of Agriculture's National Agricultural Statistics Service (NASS) which generates data on an annual, period basis, or both, depending on the crop.

Figures 8 and 9 demonstrated earlier that agricultural employment, while not declining, has become a smaller proportion of total employment. According to the Census of Agriculture, the acreage devoted to agriculture in the basin has also declined significantly. A list of significant field crops produced in the Payette River Basin from 1982 to 1992 is presented in Table 5. Harvested acres in field

crops decreased from 90,171 in 1982 to 80,119 in 1992 (a decrease of 11 percent). Acres in orchards declined from 6,786 to 4,920 (or by 27 percent) (See Table 6). Only the acreage in vegetables increased a little from 4,655 to 4,900 (see Table 7, page 28).

The substantial decline in harvested acres does not necessarily reflect a reduced demand for irrigation water. Field crops, representing the largest acreage of all crops, experienced a significantly smaller decline in irrigated acres compared with non-irrigated acres (Table 5). Irrigated acres declined from 78,433 in 1982 to 72,547 in 1992, a decrease of only 7.5 percent, whereas non-irrigated acres declined from 11,738 to 7,572, a decrease of 35 percent. Also while total acres in orchards declined by 27 percent, and almost all of these are irrigated (97 percent), they represent a small number of acres overall.

Table 5. Selected Major¹ Field Crops for All Payette River Basin Counties (acres).

Variable	1982	1987	1992
Harvested cropland ²	90171	78654	80119
Harvested cropland - irrigated	78433	71194	72547
Wheat for grain	10146	8482	10321
Wheat for grain - irrigated	8795	7146	9353
Barley for grain	10923	4901	3387
Barley for grain - irrigated	9815	4379	3069
Dry edible beans except dry limas	1229	1662	973
Dry edible beans except dry limas - irrigated	1229	1662	973
Irish potatoes	818	725	1221
Irish potatoes - irrigated	818	725	1221
Sugar beets for sugar	3600	4507	5360
Sugar beets for sugar - irrigated	3600	4507	5360
Hay - all	36476	34832	33454
Hay - all irrigated	27430	27297	28075

¹ Major crops based on total acres harvested.

² Represents cropland acres actually harvested for the year reported. It is estimated from surveys of farmers in each county.

Source: U.S. Bureau of Census, 1982; 1987; and 1992.

Table 6. Selected Specialty Fruit Crops for the Payette River Basin.¹

Variable	1982	1987	1992
Land in orchards, Total (acres)	6786	7724	4920
Land in orchards, Irrigated (acres)	6704	7717	4776
Apples, Total (acres)	5289	5866	3895
Apples, Harvested (pounds)	62,279,374	102,040,895	33,812,054
Apricots, Total (acres)	11	5	18
Apricots, Harvested (pounds)	3,900	2	53,100
Cherries, Total (acres)	362	255	141
Cherries, Harvested (pounds)	1,076,558	791,517	757,455
Sweet cherries, Total (acres)	0	153	2
Sweet cherries, Harvested (pounds)	0	2	757,455
Grapes (fresh wt), Total (acres)	41	54	2
Grapes (fresh wt), Harvested (pounds)	2	77380	2
Nectarines, Total (acres)	2	18	20
Nectarines, Harvested (pounds)	2	93650	2
Peaches, Total (acres)	296	143	119
Peaches, Harvested (pounds)	1,366,146	1,018,300	640,265
Pears, Total (acres)	57	115	29
Pears, Harvested (pounds)	143,901	124,043	71,985
Plums & prunes(fresh wt), Total (acres)	693	1015	621
Plums & prunes(fresh wt) Harvested (lb)	4,823,209	10,719,480	3,730,316

¹ Gem and Payette counties account for all production of these crops in the Payette River Basin.

² Information not reported to avoid disclosure of individual operations.

Source: U.S. Bureau of Census, 1982; 1987; and 1992.

Table 7. Selected Specialty Vegetable Crops for the Payette River Basin.*

Variable	1982	1987	1992
Vegetables harvested, total (acres)	4655	4152	4900
Vegetables harvested, irrigated (acres)	4646	4152	4900
Dry onions, total harvested (acres)	720	1295	1265
Dry onions, irrigated (acres)	720	1295	1265
Sweet corn, total harvested (acres)	3857	2762	3580
Sweet corn, irrigated (acres)	3857	2762	3580

* Gem and Payette Counties account for all production of these crops in the Payette River Basin.

Source: U.S. Bureau of Census, 1982; 1987; and 1992.

The most substantial area of agriculture occurs in the lower basin, particularly below Black Canyon Reservoir, slightly northeast of Emmett. Fruits, vegetables, and most field crops are grown in the lower basin. The proportions of total field crop acreage found in lower basin counties are presented in Table 8. The proportions are very high for all crops, both irrigated and non irrigated-acres. This illustrates the relative importance of the lower basin area for crop production and the utilization of Payette River Basin irrigation water.

Livestock, previously important in the agricultural economy of the lower basin, appears to play a steadily smaller role. Figure 12 illustrates cash receipts from crops and livestock during the period from 1969 to 1995. Cash receipts from livestock are greater than crop receipts in 1980, but are less than crop receipts by 1983 and through 1995. Hence, there appears to be a change from a primarily livestock-based economy to one that has slightly greater emphasis on crops.

There have also been substantial changes in field cropping patterns between 1982 and 1992, implying potentially important changes in water demand. The major crops measured by acreage are hay and wheat. The irrigated acreage allocated to potatoes and sugar beets, relatively high users of water, increased substantially over the ten-year period, whereas the irrigated acreage in barley and

beans, relatively low users of water, declined substantially. Irrigated acreage allocated to hay and wheat increased a little.

There have been some noteworthy changes in the composition of vegetables. Onion production has increased substantially while sweet corn has fallen somewhat (See Table 7). These constitute the largest vegetable crops measured in terms of harvested acres. Both crops are important in the Idaho economy. In 1992 lower basin counties accounted for between 12.65 percent and 13.75 percent of fresh onion acres harvested in the state. Idaho ranked sixth in the nation in the production of sweet corn for processing, and fourth in the nation for fresh onions. It also led the nation in average yield per acre for both crops.

Many fruits are grown commercially in the lower basin. Most important, and in order of pounds harvested, are apples, plums and prunes, cherries, peaches, pears, and apricots (See Table 6, page 27). Apple, peach and pear production has declined substantially. Plum and prunes have declined somewhat less than the others, while apricot production has increased.

Table 8. Percentage of Total Selected Payette River Basin Crops Grown in Gem and Payette Counties (acres).

Variable	1982	1987	1992
Harvested cropland	87.91%	90.54%	88.87%
Harvested cropland - irrigated	93.40%	92.01%	91.99%
Wheat for grain	98.26%	96.23%	85.97%
Wheat for grain - irrigated	100.00%	100.00%	91.60%
Barley for grain	90.09%	90.14%	83.55%
Barley for grain (bushels)	92.04%	91.19%	89.66%
Barley for grain - irrigated	91.49%	90.39%	85.53%
Dry edible beans except dry limas	100.00%	100.00%	100.00%
Dry edible beans except - irrigation	100.00%	100.00%	100.00%
Irish potatoes (farms)	84.00%	81.25%	95.00%
Irish potatoes	100.00%	81.52%	100.00%
Irish potatoes - irrigated	100.00%	81.52%	100.00%
Sugar beets for sugar	100.00%	100.00%	100.00%
Sugar beets for sugar - irrigated	100.00%	100.00%	100.00%
Hay - all	76.89%	78.49%	85.65%
Hay - all, irrigated	87.68%	85.76%	89.04%

Source: U.S. Bureau of Census, 1982; 1987 and 1992.

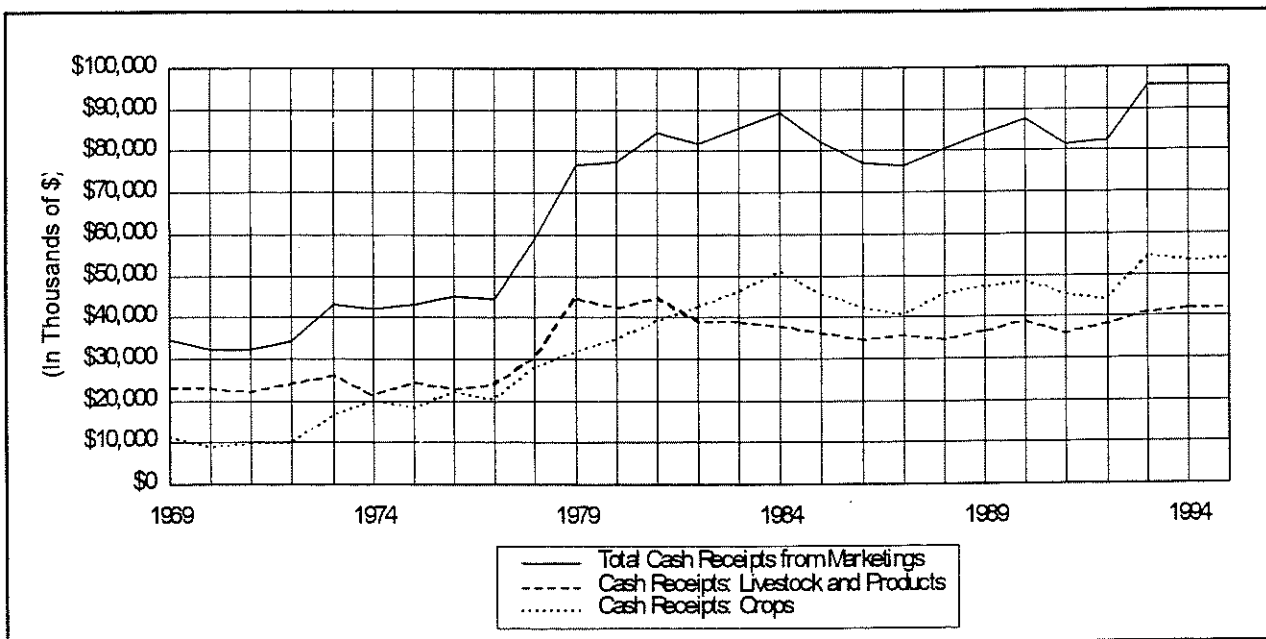


Figure 12. Cash Receipts from Marketing of Farm Products in Lower Basin Counties (U.S. Department of Commerce, 1997).